Susceptibility of Certain Apricot and Plumcot Cultivars to Plum Pox Virus Infection

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Abstract

The purpose of this research was to investigate new genetic resources for resistance to Sharka disease, which is caused by plum pox potyvirus (PPV). Sharka disease is threatening the apricot and plum industries of most European and Mediterranean countries. In apricot, PPV resistance to date has only been identified in a small number of cultivars of American origin, which have been used in Greece as parents in crosses with local cultivars. New genetic material created at the USDA/Agricultural Research Service in Fresno, California was examined for reaction to PPV after artificial inoculations by grafting and in conditions of natural virus transmission by the aphid vectors present in the field. Four trees from each of seven apricot cultivars, seven plumcots, one Pluot and one Aprium were planted at the NAGREF-Pomology Institute experimental orchard, where Sharka disease is endemic, in February 1994. All plumcot cultivars were found heavily PPV infected by the third year after planting, with very severe disease symptoms. The Aprium and Pluot also demonstrated a severe susceptibility to the disease. Among the apricots examined, only K106-2 (Robada) and 'Havecot' have escaped disease in the field.

INTRODUCTION

Sharka disease caused by PPV is one of the most serious limiting factors for apricot (*Prunus armeniaca* L.) and plum cultivars (*P. salicina* Lindl.) in many European countries. Disease control measures such as the destruction of infected trees, the use of healthy propagation materials and the application of phytosanitary quarantines, although necessary, have given limited results. The use of virus resistant cultivars is the most desirable method of control. Resistance to PPV in apricot has been identified in a small number of cultivars of American origin (Karayiannis et al., 1999). Studies on the inheritance of resistance to PPV in apricot showed that there is a gene locus responsible for the trait (Karayiannis et al., 2008; Lambert et al., 2006). Resistance to PPV in plum cultivars appears to be rare (Kegler et al., 1998). Plumcot interspecific hybrids have been created by Ramming (1976). The variability of horticultural characteristics among different plumcot progenies has been studied by Ledbetter et al. (1994). Further, the transmission of apricot flavor constituents from apricot to plumcot in specific plum × apricot crosses has also been demonstrated (Gómez and Ledbetter, 1993; Gómez et al., 1993). In the present study, the behaviour of some apricot and plumcot interspecific hybrids to PPV infection has been examined.

MATERIALS AND METHODS

In 1994, four trees from each of seven apricot hybrids and seven plumcot hybrids (all created at USDA/ARS in Parlier, CA), as well as one Pluot and one Aprium (both from Zaiger Genetics Inc., Modesto, CA) were planted at NAGREF's-Pomology Institute experimental orchard in an area where Sharka disease is endemic. In addition, each accession was also grafted in the screenhouse onto two seedlings of the woody plant indicator GF-305. The grafted seedlings were subsequently inoculated with PPV-M by chip budding. Observations for Sharka disease symptoms on the leaves of each accession were obtained in the screenhouse and in the field. Symptom expression was evaluated on

leaves during the late April-early May timeframe, and fruit symptoms were evaluated at full maturity. The scoring of vegetative and fruit symptoms occurred during five successive vegetative periods. To ascertain the presence of PPV, a DAS-ELISA test was performed using polyclonal antibodies (Clark and Adams, 1977).

RESULTS AND DISCUSSION

Leaves from most of the examined apricots and plumcots expressed intense PPV symptoms, both under artificial and natural PPV inoculation conditions. Some of the accessions have cultivar 'Orangered' as one of the parents, which has been described as resistant to PPV (Karayiannis et al., 1999). K104-98 was produced from a cross between the apricot cultivar 'Orangered' (mother parent) and selection NJA42 (pollen parent). It has expressed mild leaf symptoms and mild symptoms on the fruits, sporadically in the field.

On the contrary 'Robada' (K106-2) (Ledbetter and Ramming 1997), produced from a cross between 'Orangered' (mother parent) and selection K113-40 (pollen parent), as well as 'Havecot,' expressed mild symptoms on the leaves in the screenhouse, but they escaped symptoms of infection in the field.

All plumcot hybrids (Ledbetter et al., 1994) as well as the Aprium and Pluot have been found heavily infected, both under artificial and natural inoculation conditions.

The reaction of the genetic material examined after artificial inoculation by PPV is summarized in Table 1. The results of the ELISA test confirmed those obtained by macroscopic observations. 'Modesto,' B-51-77, K38-38, Aprium and Pluot were the accessions most susceptible to PPV, resembling the local very susceptible cv. 'P. Tirynthos.'

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Table

Table1. Index of susceptibility to Sharka disease of different apricot and plumcot hybrids after artificial inoculation by PPV.

	Date of maturity	Index of susceptibility			ELISA test in leaf samples (o.d. values)
		Leaves	Fruits	Stones	
Apricots					
1. 'Modesto'	20 June	3	3	3	1.580
2. B 51 -77	8 June	3	3	3	1.730
3. B 58 -97	18 June	3	3	3	1.420
4. P 252 -1	20 May	1	2	2	0.730
5. K 104-98	22 May	1	1	1	0.485
6. 'Robada'	10 June	1	0	0	0.295
7. 'Havecot'	16 June	1	0	0	0.220
Plumcots					
1. K 38-38	18 June	3	3	3	1.558
2. K 537-67	10 June	3	3	3	1.453
3. P 251-2	20 June	3	2	2	1.455
4. P 251-19	15 June	3	3	3	1.545
5. P 251-62	18 June	3	3	3	1.459
6. P 252-15	24 May	3	3	3	1.524
7. P 254-13	30 May	3	3	3	1.439
Aprium	20 June	3	3	3	1.541
'Pluot'	30 June	3	3	3	1.563
P.Tirynthos	05 June	3	3	3	1.530
Healthy control		0	0	0	0.195